



Climate change, precipitation and impacts on an estuarine refuge from disease

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Abstract:

BACKGROUND: Oysters play important roles in estuarine ecosystems but have suffered recently due to overfishing, pollution, and habitat loss. A tradeoff between growth rate and disease prevalence as a function of salinity makes the estuarine salinity transition of special concern for oyster survival and restoration. Estuarine salinity varies with discharge, so increases or decreases in precipitation with climate change may shift regions of low salinity and disease refuge away from optimal oyster bottom habitat, negatively impacting reproduction and survival. Temperature is an additional factor for oyster survival, and recent temperature increases have increased vulnerability to disease in higher salinity regions.

METHODOLOGY/PRINCIPAL FINDINGS: We examined growth, reproduction, and survival of oysters in the New York Harbor-Hudson River region, focusing on a low-salinity refuge in the estuary. Observations were during two years when rainfall was above average and comparable to projected future increases in precipitation in the region and a past period of about 15 years with high precipitation. We found a clear tradeoff between oyster growth and vulnerability to disease. Oysters survived well when exposed to intermediate salinities during two summers (2008, 2010) with moderate discharge conditions. However, increased precipitation and discharge in 2009 reduced salinities in the region with suitable benthic habitat, greatly increasing oyster mortality. To evaluate the estuarine conditions over longer periods, we applied a numerical model of the Hudson to simulate salinities over the past century. Model results suggest that much of the region with suitable benthic habitat that historically had been a low salinity refuge region may be vulnerable to higher mortality under projected increases in precipitation and discharge.

CONCLUSIONS/SIGNIFICANCE: Predicted increases in precipitation in the northeastern United States due to climate change may lower salinities past important thresholds for oyster survival in estuarine regions with appropriate substrate, potentially disrupting metapopulation dynamics and impeding oyster restoration efforts, especially in the Hudson estuary where a large basin constitutes an excellent refuge from disease.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3084236>

Resource Description

Communication: ☒

resource focus on research or methods on how to communicate or frame issues on climate change;
surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☒

audience to whom the resource is directed

Climate Change and Human Health Literature Portal

Policymaker

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Security, Precipitation

Food/Water Security: Fisheries

Geographic Feature:

resource focuses on specific type of geography

Ocean/Coastal

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content